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(54) Title: COMPOSITIONS AND METHODS FOR KILLING OR REPELLING INSECTS

## (57) Abstract

The present invention provides a composition and method for killing or repelling insects, preferably lice and, more preferably, head lice or body lice. The composition comprises an essential oil and preferably comprises two, three or four essential oils. The composition can also comprise an alcohol or a non-essential oil. In addition, the present invention provides a method for treating or repelling insects, preferably lice and, more preferably, head lice or body lice. The method comprises contacting a subject with a composition comprising an essential oil.

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**COMPOSITIONS AND METHODS FOR KILLING OR REPELLING INSECTS**Field of the Invention

This invention generally relates to compositions and methods for treating insects, including 5 lice, in human beings or animals.

Background of the Invention

The human head louse is a small insect which commonly infests the scalps of humans, particularly school children. It has been estimated that 10 to 12 10 million Americans a year suffer from head lice (Time Magazine, June 12, 1998, page 73). Although head lice do not normally carry disease, they cause itching and are unsightly.

Traditionally, infestations of head lice have 15 been treated with pesticides such as malathion, lindane, pyrethrin, permethrin, carbaryl, pnenethrin, and phenothrin. See, for example, Hayes, Jr. and Laws Jr., The Handbook of Pesticide Toxicology (Academic Press 1991), which is incorporated herein by reference. 20 However, head lice are becoming resistant to these pesticides (Time Magazine, June 12, 1998, page 73). Thus, there is a need for a method for treating head lice that is not dependent on pesticides to which the head lice can become resistant.

In addition, application of pesticides to the scalps of school children can have detrimental side effects. For example, lindane can cause aplastic anemia and neurotoxicity. Pyrethrin can cause pneumonia, muscle 5 paralysis, death due to respiratory failure, vomiting, and asthma. See, for example, R. Winter, A Consumer's Guide of Cosmetic Ingredients (Random House 1994), which is incorporated herein by reference. Thus, there is a need for a method of treating head lice which does not 10 involve application of such pesticides to the scalps of children. The present invention satisfies these as well as other needs.

#### Summary of the Invention

The present invention provides a composition 15 and method for treating insects, preferably lice and, more preferably, head lice or body lice. The composition comprises an essential oil and preferably comprises two, three or four essential oils. The composition can also comprise an alcohol or a non-essential oil.

20 In addition, the present invention provides a method for treating or repelling insects, preferably lice and, more preferably, head lice or body lice. The method comprises contacting a subject with a composition comprising an essential oil.

25

#### Detailed Description

Several novel formulations have been found which are effective in knocking down and/or killing head lice. The formulations do not contain any pesticides to 30 which the head lice can become resistant or which could

cause harm to school children when the formulation is applied to their hair.

Advantageously, the formulation comprises two, three, four or more essential oils. Preferably, the 5 formulation also comprises a carrier fluid such as an alcohol or a non-essential oil. Even more preferably, the formulation comprises one or more essential oils in combination with one or more carrier fluids.

As used herein, the term "essential oil" means 10 a volatile oil derived from the leaves, stem, flower or twigs of plants. The essential oil usually carries the odor or flavor of the plant. Chemically, the oil is often a terpene, but many other types also occur. Except for those containing esters, essential oils are 15 unsaponifiable.

Essential oils can be pure single compounds, for example, wintergreen oil (methyl salicylate). However, other essential oils are mixtures of compounds, for example turpentine oil (pinene and dipentene); bitter 20 almond oil (benzaldehyde and hydrocyanic acid); lavender oil (including borneol, fenchol, linalol,  $\alpha$ -terpineol, terpinen-4-ol, geranyl acetate, linanyl acetate, terpenyl acetate, camphor, 1,8-cineole, camphene, limonene, pinene,  $\beta$ -caryophyllene, farnascene and coumarin); and 25 tea tree oil (including linalol,  $\alpha$ -terpineol, terpinen-4-ol, 1,8-cineole, limonene, myrcene, phellandrene, pinene,  $\alpha$ -terpene,  $\beta$ -caryophyllene and sabinene). Other essential oils, their chemistry and plant families are known in the art. See, for example, S. Price, Aroma 30 Therapy Workbook, (Thorsons, 1993); J. Rose, Aroma Therapy Book (North Atlantic Books, 1992); and The Merck

Index (12th Ed. 1996), each of which is incorporated herein by reference.

When the essential oil is a mixture of compounds, the present invention encompasses one or more 5 of such compounds. The present invention also encompasses variants or mimics of such compounds that share one or more of their characteristics or functions.

An essential oil can be derived by several methods, including steam distillation, pressing fruit 10 rinds, solvent extraction, macerating the flowers and leaves in fat and treating the fat with solvent, enfleurage and synthetically. See, for example, Aromatherapy Workbook, *supra*.

15 Other examples of essential oils include, but are not limited to, eucalyptus oil, geranium oil, lemongrass oil, petigrain oil, rosemary oil and thyme oil. In one embodiment, a composition of the invention comprises one of several specific pairs of essential 20 oils: lavender oil and tea tree oil; rosemary oil and tea tree oil; lemongrass oil and tea tree oil; petigrain oil and tea tree oil; geranium oil and tea tree oil; lavender oil and rosemary oil; lavender oil and lemongrass oil; lavender oil and eucalyptus oil; petigrain oil and 25 rosemary oil; petigrain oil and lemongrass oil; geranium oil and eucalyptus oil; petigrain oil and eucalyptus oil; rosemary oil and eucalyptus oil; geranium oil and rosemary oil; or geranium oil and lemongrass oil. In each of these pairs, their ratios can be from about 1:4 30 to about 4:1. In another embodiment, the composition comprises four specific essential oils: lavender oil, tea tree oil, rosemary oil and petigrain oil.

In one aspect of the invention, the composition comprises at least 0.5% essential oils. More preferably, the composition comprises at least 1% essential oils and, even more preferably, 1.5%, 2%, 2.5%, 3%, 4%, 5%, 6%, 7%, 5 8%, 10%, 12%, 15%, 20%, 25%, 30%, 35%, 40% or 50% essential oils.

Moreover, compositions of the invention can comprise a carrier fluid such as an alcohol or a non-essential oil. As used herein, a "non-essential oil" 10 means an oil that is not an "essential oil" as defined above.

Some examples of alcohols which can be used include, but are not limited to, methanol, ethanol, propanol, isopropanol, butanol, sec-butanol, 15 tert-butanol, pentanol and its various isomers, hexanol and its various isomers, and mixtures thereof. Similarly, glycols can be used as carrier fluids. Some suitable glycols include, but are not limited to, ethylene glycol, propylene glycol, butylene glycol, 20 trimethylene glycol, glycerol, pinacol, and their mixtures.

Non-essential oils which can be suitable as carrier fluids can be synthetic, refined, or natural. 25 Synthetic oils can include petroleum sources, chemicals, or hydrocarbon materials which have been processed. Refined oils are oils which have been processed, either by distillation or chemical processing, for example, by treatment with an acid. Mineral oil is an example of a 30 refined oil. Natural oils are most often obtained from plants or animals, either directly or through processing. Some examples of natural oils include, but are not

limited to, safflower oil, almond oil, olive oil, and coconut oil.

Other classes of carrier fluids which are suitable for use in this invention include, but are not limited to, glycols, ethers, ketones, aqueous solutions, oils and organic solvents. Mixtures of these carrier fluids can also be useful in practicing the invention. The carrier fluid can preferably form a solution or an emulsion with the one or more essential oils.

Ethers are also suitable as carrier fluids in the invention. Some examples include, but are not limited to, diethyl ether, n-propyl ether, isopropyl ether, ethylene glycol monomethyl ether, ethylene glycol dimethyl ether, ethylene glycol monoethyl ether, ethylene glycol diethylether, propylene glycol mono- and dimethyl ethers, propylene glycol mono and diethyl ethers, butylene glycol mono and dimethyl ethers, butylene glycol mono and diethyl ethers, and their mixtures.

Ketones can also be suitable carrier fluids in preparing the formulations for use in this invention. Some suitable ketones include, but are not limited to, acetone, methyl ethyl ketone, methyl propyl ketone, ethyl ketone, methyl isopropyl ketone, benzyl methyl ketone, and their mixtures.

Aqueous solutions can also be suitable carrier fluids. Preferably, the aqueous solution contains a compound which helps to solubilize or emulsify the one or more essential oils into the aqueous solution. Some compounds which might be suitable to help to solubilize or emulsify the essential oils in the aqueous solution

include, but are not limited to, surfactants, alcohols, ethers, ketones, and the like.

Several exemplary carrier fluids for formulating the composition for treating lice comprise 5 one or more non-essential oils. Advantageously, more than one non-essential oil can be included in the. Exemplary non-essential oil that are natural oils include olive oil and coconut oil. Preferably, both olive oil and coconut oil can be used.

10 One skilled in the art can determine an optimal formulation for the carrier fluid to be used with a particular essential oil or blend of essential oils.

One skilled in the art can also determine an effective amount of the composition of the invention for 15 killing or repelling insects including lice. See Example 5, which describes the effectiveness of 4 ml of a composition of the invention. However, a composition of the invention can also be effective at 1  $\mu$ l, 1 ml, 2 ml or greater.

20 In one preferred embodiment, the essential oil blend comprises lavender oil and tea tree oil in a ratio of about 5:1 to about 3:1. More preferably, the ratio is about 4:1. Other essential oils, including those specified above, can also be comprised in these ratios.

25 In another preferred embodiment, the essential oil blend comprises eucalyptus oil and geranium oil in a ratio of about 5:1 to about 3:1. More preferably, the ratio is about 4:1.

In an additional preferred embodiment, the essential oil blend comprises petigrain oil, rosemary oil, tea tree oil and lavender oil in a ratio where each of the four oils is present at least at half the 5 concentration of each of the other three and no more than twice the concentration of each of the other three. More preferably, the ratio is about 1:1:1:1. Other essential oils, including those specified above, can also be comprised in these ratios.

10 In one preferred embodiment, the non-essential oil blend which is used as the carrier fluid comprises a mixture of safflower oil, olive oil, and coconut oil. The percentage of safflower oil in the base oil is preferably in the range of 1-100%, more preferably in the 15 range of about 20-98%, and most preferably in the range of about 40-95%. The percentage of olive oil in the base oil blend is preferably in the range of 1-40%, more preferably in the range of about 2-20%, and most preferably in the range of about 5-15%. The percentage 20 of coconut oil in the base oil blend is in the range of about 0.25-15%, more preferably in the range of about 0.5-8%, and most preferably in the range of about 1-5%.

In another preferred embodiment, the non-essential oil blend used as the carrier fluid comprises a 25 mixture of almond oil, olive oil, and coconut oil. The percentage of almond oil is preferably in the range of 1-100%, more preferably in the range of about 20-98%, and most preferably in the range of about 40-95%. The percentage of olive oil in the base oil blend is 30 preferably in the range of 1-40%, more preferably in the range of about 2-20%, and most preferably in the range of about 5-15%. The percentage of coconut oil in the base oil blend is in the range of about 0.25-15%, more

preferably in the range of about 0.5-8%, and most preferably in the range of about 1-5%.

In another preferred embodiment, the base oil blend used as the carrier fluid comprises a mixture of 5 sunflower oil, olive oil, and coconut oil. The percentage of sunflower oil is preferably in the range of 1-100%, more preferably in the range of about 20-98%, and most preferably in the range of about 40-95%. The percentage of olive oil in the base oil blend is 10 preferably in the range of 1-40%, more preferably in the range of about 2-20%, and most preferably in the range of about 5-15%. The percentage of coconut oil in the base oil blend is in the range of about 0.25-15%, more preferably in the range of about 0.5-8%, and most 15 preferably in the range of about 1-5%.

In another preferred embodiment, the base oil blend used as the carrier fluid comprises a mixture of coconut oil and olive oil, preferably in the range of about 3:1 to about 5:1 and, more preferably, in the range 20 of about 4:1.

A preferred embodiment of the composition of the invention comprises a combination of an essential oil blend and a non-essential oil blend as the carrier fluid. Preferably, the essential oil blend is added to the base 25 oil blend in a ratio of about 1:99 to about 50:50. More preferably, the ratio of essential oil blend to base oil blend is between about 2:98 and about 45:55. More preferably, the ratio is about 3:97 to about 40:60. More preferably, the ratio is about 4:96 to about 35:65. More 30 preferably, the ratio is about 5:95 to about 30:70.

Another form of the composition of the invention comprises one or more alcohols as the carrier fluid. One preferred alcohol is isopropyl alcohol, either alone or in combination with other alcohols or 5 other solvents. The carrier fluid comprising one or more alcohols is preferably blended with one or more essential oils. The ratio of carrier fluid comprising one or more alcohols to essential oil is preferably in the range between about 50:50 and about 95:5. More preferably the 10 ratio of carrier fluid comprising alcohols to essential oil is in the range between about 70:30 to about 90:10. Most preferably, the ratio is about 80:20, carrier fluid to essential oil or essential oil blend.

Another form of the composition of the 15 invention comprises one or more alcohols and one or more non-essential oils as the carrier fluid. A preferred example is coconut oil and olive oil as the non-essential oil blend. The carrier fluid and essential oils can be in the range of about 5:1 to about 1:1 and, more 20 preferably, about 3:1. The non-essential oils and alcohol can be in the range of about 3:1 to about 1:1 and, more preferably, about 2:1.

A composition of the invention can be used to repel or kill insects, more preferably head lice or body 25 lice. Other insects include, but are not limited to, wall lice, pubic lice, horse lice, chinch bugs, redcoats, mahogany flats, bedbugs, chiggers, fleas (including sand fleas, snow fleas and human fleas), drain flies, fruit flies, mites, weevils, aphids, white flies, mosquitos, 30 ticks, scabies, ants, gnats and black flies.

A composition of the invention can be applied to the affected area in a variety of manners, including

spraying, dipping, rubbing and pouring. Preferably, the composition can be applied to the affected area as a neat solution without added water.

To treat head lice, the composition can be applied to the hair and scalp and allowed to remain for a period of about 5 minutes to about 2 days. The formulation can be allowed to remain on the hair for a period of about 1 hour to 24 hours. The formulation can also be allowed to remain on the hair for a period of about 2-10 hours.

Preferably, the hair in the affected area is combed a section at a time after the soaking period to remove lice and nits. Even more preferably, the hair is shampooed after combing.

Preferably, the application of the composition can be repeated, for example once a day or every 2-3 days for a period of time. Preferably, the application of the head lice formulation is repeated every 1-3 days over a period of 2 days to about 3 weeks. Most preferably, the application is repeated every 2-3 days for about 7-10 days.

A composition of the invention can be applied to prevent head lice from being transmitted to the scalp from other people. Head lice can be passed from person to person when a hat is exchanged, for example. Application of the head lice formulation before exposure to head lice from, for example, hat exchange can minimize the chances of head lice being transmitted from person to person.

The following examples are given to illustrate various aspects of the invention but are not meant to limit it.

5

Example 1**Preparation of a Composition**

An essential oil blend was prepared by mixing lavender oil and tea tree oil in a ratio of 4:1. A non-essential oil blend for the carrier fluid was prepared by 10 mixing safflower oil, olive oil, and coconut oil in a ratio of 22:3:1. The essential oil blend and the non-essential oil blend were mixed in a ratio of 5:95 to make a head lice formulation containing 5% essential oil.

Example 2

15

**Demonstration of the Effectiveness of Composition in Treating Lice**

The composition prepared according to Example 1 was tested for its effectiveness in treating lice. Five replicates of 25 adult human body lice were tested using 20 test method ASTM E 938 - 83 (published June, 1983), Standard Test Method for Determining the Effectiveness of Liquid, Gel, Cream, or Shampoo Insecticides Against Adult Human Lice, which is incorporated herein by reference. The test method involves immersing lice in the test 25 product for a set period of time, followed by washing and rinsing in water for one minute each. For this test, an immersion time of 3 hours was used.

The effectiveness of the composition was 30 compared with immersing the lice in water for 3 hours and

with an untreated control. The comparison with simple immersion was to show that the mortality of the lice was not simply due to the immersion.

Observations of knockdown (i.e., immobilized 5 lice) were taken after 1 hour and for mortality at 24 hours for all three sets of tests. The results are shown in Table 1.

Table 1

	<b>Test</b>	<b>% Knockdown (1 Hr.)</b>	<b>% Mortality (24 Hr.)</b>
10	Untreated Control	0	11.8
	Immersed Control	4.3	10.6
15	Head Lice Formulation	100	96.5

As shown in Table 1, the composition was 100% effective in knocking down the lice after 1 hour, and 96.5% effective in killing the lice within 24 hours. By comparison, immersion in water knocked down only 4.3% of 20 the lice after 1 hour and killed only 10.6% of the lice after 24 hours.

The composition described in Example 1 was therefore highly effective in knocking down and killing lice. It is important to note that the 100% knockdown 25 should result in the removal of all lice from the treated individual. Once removed from the host, lice are

unlikely to survive unless they are able to return to the host or to find another one. Thus, the 3.5% of lice surviving at 24 hours would probably die within a few days (in the case of body lice) or a day (in the case of 5 head lice). The head lice formulation of Example 1 was therefore shown to be highly effective in killing lice.

The ASTM method uses body lice rather than head lice, because head lice have not been successfully reared in the laboratory.

10

Example 3**Preparation of a Second Composition**

An essential oil blend was prepared by mixing eucalyptus oil and geranium oil in a ratio of 4:1. A non-essential oil blend was prepared by mixing sunflower 15 oil, olive oil, and coconut oil in a ratio of 22:3:1. The essential oil blend and the non-essential oil blend were mixed in a ratio of 5:95.

Example 4**Preparation of a Third Composition**

20 An essential oil blend was prepared by mixing lavender oil, tea tree oil, eucalyptus oil and geranium oil in a ratio of 1:1:1:1. A non-essential oil blend was prepared by mixing coconut oil and olive oil in a ratio of 4:1 and mixing the blend with alcohol in a ratio of

2:1: The essential oil blend, non-essential oil blend and alcohol were therefore mixed in a ratio of 25:55:25.

Example 5

## Demonstration of the Effectiveness of

5

## Composition in Treating Lice

The composition prepared according to Example 4 was tested for its effectiveness in treating lice. Five replicates of 25 adult human body lice were tested using test method ASTM E 938 - 83

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### *In Vitro*

15 Eighteen live lice were dipped for two hours in the composition in two separate test runs. After removing from the composition, the lice were rinsed with tap water through a strainer and placed on a cotton disk in a Petri dish for observation. All lice appeared dead after rinse off and did not revive in the four hours of observation.

15 Fifteen live lice were then dipped for one hour  
20 in the composition in three separate test runs. The same  
rinsing procedure was followed as in the two-hour dip.  
At rinse off, all lice appeared dead and did not revive  
in the four hours of observation.

25 To ascertain the killing time of the  
composition, thirteen live lice were tested using the

"disk method" in three separate test runs. This method simulates the experience of lice walking on hair that has saturated with a pediculicidal product. The live lice were placed on a cotton disk impregnated with 0.4 ml of 5 the composition and observed at regular intervals for 4 hours. The lice were immediately affected by the test solution and their movement became impaired minutes after being exposed to the impregnated disk. After 1 hour of exposure they were unable to walk and were clearly dying. 10 Five lice died in 1 hour and 15 minutes, five died after 1 hour and 40 minutes. Three lice were unable to move after 2 hours and died before three hours.

The same procedures were followed for control 15 lice obtained from the same individuals and were exposed only to water. At the end of the four-hour observation period, all control lice were healthy and walking.

*In vivo*

20 Two patients with severe infestations were treated with the composition by application on dry hair until all hairs and scalp were saturated. Each patient's head was then covered with a surgical cap with an elastic band around the hairline to allow free flow of air, while 25 protecting the eyes, face and clothes from dripping. After one hour of exposure, the hair was washed with the composition and rinsed with tap water. The procedure was repeated. The lice that came off the hair at rinse-off were collected and evaluated.

30

Approximately 275 lice were evaluated using this method. Of these, about 89.8% were dead at rinse off. 32 ( about 10.5%) were still alive.

The live lice were placed in a Petri dish for observation. The behavior of the lice clearly indicated that they were affected. They were moving slowly, unable to walk, but were not twitching or convulsing, as seen 5 with other currently available pediculicides, such as lindane, pyrethrins and permethrin. After four hours of observation, the lice were barely moving and definitely not capable of walking, copulating, feeding or infesting others, i.e they were unable to survive.

10

Lice were collected from the two volunteers pre-treatment as controls, and placed on cottoned disks dampened with water and observed. At the end of the four hour observation period, all control lice were healthy 15 and walking.

*In vitro* results show that the composition has a killing time of under two hours, and possibly less, when lice are exposed to an ample amount. *In-vivo* 20 results also show the effectiveness of the composition.

#### Example 5

#### **Treatment of Children Suffering From Head Lice Infestation**

The composition of Example 1, Example 3 or 25 Example 4 is supplied to school children who suffered from head lice. The composition is applied in the following manner:

1. To dry hair and scalp.

2. Left for 2-3 hours or overnight.
3. The hair is combed a section at a time to remove lice and nits.

5 The treatment is effective in eliminating head lice from the hair and scalps of the school children.

Example 6

**Effectiveness of Composition  
in Preventing Infestation With Head Lice**

10

A preventative program for head lice is carried out as follows:

15 1. The composition of Examples 1, 3 or 4 is applied once a week for a period of 4-6 weeks while checking for head lice and nits.

2. After 4-6 weeks, the head lice formulation is applied once a month.

20 3. The hair is checked weekly with a comb for head lice or nits.

The preventative program is effective in preventing infestation with head lice.

It should be understood that the invention is  
5 not limited to the embodiments disclosed herein.

**I claim:**

1. A composition comprising two essential oils.
2. The composition of claim 1, comprising three essential oils.  
5 3. The composition of claim 1, comprising four essential oils.
4. The composition of claim 1, wherein the essential oils are selected from the group consisting of lavender oil, tea tree oil, eucalyptus oil, geranium oil, 10 lemongrass oil, petigrain oil, rosemary oil and thyme oil.
5. The composition of claim 1, wherein the two essential oils are selected from the group consisting of lavender oil and tea tree oil; rosemary oil and tea tree 15 oil; lemongrass oil and tea tree oil; petigrain oil and tea tree oil; geranium oil and tea tree oil; lavender oil and rosemary oil; lavender oil and lemongrass oil; lavender oil and eucalyptus oil; petigrain oil and rosemary oil; petigrain oil and lemongrass oil; geranium 20 oil and eucalyptus oil; petigrain oil and eucalyptus oil; rosemary oil and eucalyptus oil; geranium oil and rosemary oil; and geranium oil and lemongrass oil.
6. The composition of claim 3, comprising lavender oil, tea tree oil, rosemary oil and petigrain 25 oil.

7. The composition of claim 1, comprising at least 1% essential oils.

8. The composition of claim 1, comprising at least 1.5% essential oils.

5 9. The composition of claim 1, comprising at least 2% essential oils.

10. The composition of claim 1, comprising at least 3% essential oils.

11. The composition of claim 1, further  
10 comprising a carrier fluid selected from the group  
consisting of an alcohol and a non-essential oil.

12. The composition of claim 11, wherein the  
non-essential oil is selected from the group consisting  
of olive oil, coconut oil, almond oil, safflower oil and  
15 sunflower oil.

13. The composition of claim 11, comprising two  
non-essential oils.

14. The composition of claim 11, comprising a  
non-essential oil and an alcohol.

20 15. The composition of claim 13, further  
comprising an alcohol.

16. A method of killing or repelling insects on a subject, comprising contacting the subject with a composition comprising an essential oil.

17. The method of claim 16, wherein said 5 insects are lice.

18. The method of claim 16, wherein the insects are head lice.

19. The method of claim 16, wherein the insects are killed.

10 20. The method of claim 16, wherein the insects are repelled.

21. The method of claim 16, wherein the composition comprises two essential oils.

15 22. The method of claim 16, wherein the composition comprises three essential oils.

23. The method of claim 16, wherein the composition comprises four essential oils.

24. The method of claim 16, wherein the essential oil is selected from the group consisting of 20 lavender oil, tea tree oil, eucalyptus oil, geranium oil, lemongrass oil, petigrain oil, rosemary oil and thyme oil.

25. The method of claim 21, wherein the two essential oils are selected from the group consisting of lavender oil and tea tree oil; rosemary oil and tea tree oil; lemongrass oil and tea tree oil; petigrain oil and 5 tea tree oil; geranium oil and tea tree oil; lavender oil and rosemary oil; lavender oil and lemongrass oil; lavender oil and eucalyptus oil; petigrain oil and rosemary oil; petigrain oil and lemongrass oil; geranium oil and eucalyptus oil; petigrain oil and eucalyptus oil; 10 rosemary oil and eucalyptus oil; geranium oil and rosemary oil; and geranium oil and lemongrass oil.

26. The method of claim 23, wherein the essential oils comprise lavender oil, tea tree oil, rosemary oil and petigrain oil.

15 27. The method of claim 16, wherein the composition comprises at least 1% essential oil.

28. The method of claim 16, wherein the composition comprises at least 1.5% essential oil.

20 29. The method of claim 16, wherein the composition comprises at least 2% essential oil.

30. The method of claim 16, wherein the composition comprises at least 3% essential oil.

25 31. The method of claim 16, wherein the composition further comprises a carrier fluid selected from the group consisting of an alcohol and non-essential oil.

32. The method of claim 31, wherein the non-essential oil is selected from the group consisting of olive oil, coconut oil, almond oil, safflower oil and sunflower oil.

5 33. The method of claim 31, wherein the composition comprises two non-essential oils.

34. The method of claim 31, wherein the composition comprises a non-essential oil and an alcohol.

10 35. The method of claim 33, wherein the composition further comprises an alcohol.

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/14780

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :A61K 35/78

US CL :424/195.1

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 424/195.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, CA

lavender, tea tree, eucalyptus, lemon grass, geranium, rosemary, petigrain, oils, repellent, lice

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,518,736 A (MAGDASSI et al) 21 May 1996, abstract, col. 2, lines 6-8 & 39-41, col. 4, lines 48-52.	1-2, 4-5, 7-10, 16-18, 20-22, 24-25, 27-30
X	US 5,578,307 A (WUNDERLICH et al) 26 November 1996, abstract, col. 3, lines 39-53, col. 8, lines 17-35.	1-5, 7-15
Y		6
X	CA 2197413 A (LEVIN et al) 29 September 1997, (Canadian Laid - Open Application) entire document.	1-5, 7-25, 27-35
Y	US 5,716,602 A (UICK) 10 February 1998, col. 2, lines 8-26.	1-16, 20-35

 Further documents are listed in the continuation of Box C.

See patent family annex.

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*O* document referring to an oral disclosure, use, exhibition or other means		
*P* document published prior to the international filing date but later than the priority date claimed		

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Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231  
Facsimile No. (703) 305-3230Authorized officer  
ANGELA N. TRAFTON  
Telephone No. (703) 308-0196JOYCE BRIDGERS  
PARALEGAL SPECIALIST  
CHEMICAL MATRIX

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US99/14780

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,738, 863 A (SACKIN et al) 14 April 1998, col.1, 64-65, col. 2, lines 57-64.	1-11, 16, 20-31, 33-35

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<p>(21) International Application Number: PCT/US99/14780</p> <p>(22) International Filing Date: 29 June 1999 (29.06.99)</p> <p>(30) Priority Data: 60/091,325 30 June 1998 (30.06.98) US</p> <p>(71) Applicant (<i>for all designated States except US</i>): ARBOR VIDA NATURAL PRODUCTS [US/US]; 1630 Mimulus Way, La Jolla, CA 92037 (US).</p> <p>(72) Inventor; and</p> <p>(75) Inventor/Applicant (<i>for US only</i>): De WOLFF, Ricki [US/US]; 1630 Mimulus Way, La Jolla, CA 92037 (US).</p> <p>(74) Agents: SPOLTER, David, I. et al.; Campbell and Flores LLP, Suite 700, 4370 La Jolla Village Drive, San Diego, CA 92122 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i> <i>With amended claims.</i></p> <p><b>Date of publication of the amended claims:</b> 24 February 2000 (24.02.00)</p>	
<p>(54) Title: COMPOSITIONS AND METHODS FOR KILLING OR REPELLING INSECTS</p> <p>(57) Abstract</p> <p>The present invention provides a composition and method for killing or repelling insects, preferably lice and, more preferably, head lice or body lice. The composition comprises an essential oil and preferably comprises two, three or four essential oils. The composition can also comprise an alcohol or a non-essential oil. In addition, the present invention provides a method for treating or repelling insects, preferably lice and, more preferably, head lice or body lice. The method comprises contacting a subject with a composition comprising an essential oil.</p>			

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**AMENDED CLAIMS**

[received by the International Bureau on 28 December 1999 (28.12.99);  
original claims 30-35 replaced by amended claims 30-32 (6 pages)]

1. A composition comprising four essential  
5 oils.

2. The composition of claim 1, wherein the  
four essential oils are selected from the group  
consisting of lavender oil, tea tree oil, eucalyptus oil,  
10 geranium oil, lemongrass oil, petigrain oil, rosemary oil  
and thyme oil.

3. A composition comprising two essential  
oils selected from the group consisting of lavender oil  
15 and tea tree oil; rosemary oil and tea tree oil;  
lemongrass oil and tea tree oil; petigrain oil and tea  
tree oil; geranium oil and tea tree oil; lavender oil and  
lemongrass oil; lavender oil and eucalyptus oil;  
petigrain oil and rosemary oil; petigrain oil and  
20 lemongrass oil; geranium oil and eucalyptus oil;  
petigrain oil and eucalyptus oil; geranium oil and  
rosemary oil; and geranium oil and lemongrass oil.

4. The composition of claim 3, wherein the  
25 two essential oils are lemongrass oil and tea tree oil.

5. The composition of claim 1, wherein the  
four essential oils are lavender oil, tea tree oil,  
rosemary oil and petigrain oil.

30

6. The composition of claim 3, comprising at  
least 1% essential oils.

7. The composition of claim 3, comprising at least 1.5% essential oils.

8. The composition of claim 3, comprising at 5 least 2% essential oils.

9. The composition of claim 3, comprising at least 3% essential oils.

10 10. The composition of claim 3, further comprising a carrier fluid selected from the group consisting of an alcohol and a non-essential oil.

11. The composition of claim 10, wherein the 15 non-essential oil is selected from the group consisting of olive oil, coconut oil, almond oil, safflower oil and sunflower oil.

12. The composition of claim 10, comprising 20 two non-essential oils.

13. The composition of claim 10, comprising a non-essential oil and an alcohol.

25 14. The composition of claim 12, further comprising an alcohol.

15. A method of killing or repelling insects on a subject, comprising contacting the subject with a 30 composition comprising two essential oils selected from the group consisting of lavender oil and tea tree oil; rosemary oil and tea tree oil; lemongrass oil and tea tree oil; petigrain oil and tea tree oil; geranium oil and tea tree oil; lavender oil and rosemary oil; lavender 35 oil and lemongrass oil; lavender oil and eucalyptus oil;

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petigrain oil and rosemary oil; petigrain oil and  
lemongrass oil; geranium oil and eucalyptus oil;  
petigrain oil and eucalyptus oil; rosemary oil and  
eucalyptus oil; geranium oil and rosemary oil; and  
5 geranium oil and lemongrass oil.

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16. The method of claim 15, wherein said insects are lice.

17. The method of claim 15, wherein the 5 insects are head lice.

18. The method of claim 15, wherein the insects are killed.

10 19. The method of claim 15, wherein the insects are repelled.

15 20. The method of claim 15, wherein the two essential oils are lemongrass oil and tea tree oil.

21. A method of killing or repelling insects on a subject, comprising contacting the subject with a composition comprising four essential oils.

20 22. The method of claim 21, wherein the four essential oils are selected from the group consisting of lavender oil, tea tree oil, eucalyptus oil, geranium oil, lemongrass oil, petigrain oil, rosemary oil and thyme oil.

25 23. The method of claim 21, wherein the four essential oils are lavender oil, tea tree oil, rosemary oil and petigrain oil.

30 24. The method of claim 15, wherein the composition comprises at least 1% essential oil.

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25. The method of claim 15, wherein the composition comprises at least 1.5% essential oil.

26. The method of claim 15, wherein the 5 composition comprises at least 2% essential oil.

27. The method of claim 15, wherein the composition comprises at least 3% essential oil.

10 28. The method of claim 15, wherein the composition further comprises a carrier fluid selected from the group consisting of an alcohol and non-essential oil.

15 29. The method of claim 28, wherein the non-essential oil is selected from the group consisting of olive oil, coconut oil, almond oil, safflower oil and sunflower oil.

20 30. The method of claim 28, wherein the composition comprises two non-essential oils.

31. The method of claim 28, wherein the composition comprises a non-essential oil and an alcohol.

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32. The method of claim 30, wherein the composition further comprises an alcohol.